भारतीय मानक
Indian Standard

IS 13944 : 2021

स्वचल वाहन — बसों के लिए खिड़की अवधारण और विमोचन तंत्र — सुरक्षा अपेक्षाएँ

(पहला पुनरीक्षण)

Automotive Vehicles — Window Retention and Release Systems for Buses — Safety Requirements

(First Revision)

ICS 43.040

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Automotive Body, Chassis, Accessories, Springs and Suspension Systems Sectional Committee, TED 06

FOREWORD

This Indian Standard (First Revision) was adopted by Bureau of Indian Standards after the draft finalized by the Automotive Body, Chassis, Accessories, Springs and Suspension Systems Sectional Committee and approved by the Transport Engineering Division Council.

This standard was first published in 1994. This revision has been undertaken to align requirements of window retention tests with NHTSA Standard No. 217 NHTSA Standard No. 217 'Bus window retention and release' issued by Dept. of Transportation (DOT). It is intended to lay down the safety requirements for bus windows/door retention and release mechanisms, meant for carrying passengers. Special attention has been paid to the requirements regarding buses meant for school children. The emergency exit arrangements, their extensions and identification have also been included. However, buses meant for carrying invalids or disabled are not covered under this standard.

The retention devices have to be so designed as to minimize chances of being thrown out of the bus in the event of any type of accidents. The emergency egresses should be easy to operate, conveniently located with operations to open/push/pull well illustrated to prevent any confusion. It is also intended to bring in unity in design and construction of bus bodies providing maximum safety to the occupants.

In the preparation of this Indian Standard considerable assistance has been drawn from NHTSA Standard No. 217 'Bus window retention and release' issued by Dept. of Transportation (DOT), USA and Safety Standard No. SS 32/1993 of ARAI, Pune.

The emergency exit requirements pertaining to dimensions and identifications are explicitly incorporated in "Code of Practice for Bus Body Design and Approval – AIS-052 (Rev. 1).", Additional requirements AIS 153 and "Requirements of School Buses – AIS 063". In order to avoid duplication the relevant clauses are deleted from this standard.

Central Motor Vehicles Rules refers to many Automotive Industry Standards (AIS) formulated by Automotive Industry Standards Committee (AISC) till such time corresponding BIS Specifications are notified. Under the same provision Automotive Industry Standards (AIS) referred in this Indian Standard will be replaced by BIS Standards after corresponding BIS Standards are formulated and notified.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

AUTOMOTIVE VEHICLES — WINDOW RETENTION AND RELEASE SYSTEMS FOR BUSES — SAFETY REQUIREMENTS

(First Revision)

1 SCOPE

1.1 This standard specifies requirements for the retention of windows (excluding windshield) and operating forces.

1.2 This standard shall be applicable to all M2 and M3 category vehicles other than those mentioned in **1.2.1**.

1.2.1 This standard is not applicable to the following.

1.2.1.1 Vehicles, whose Gross Vehicle Weight (GVW) is less than 3.5 tons.

1.2.1.2 All vehicles meant for carrying military troops, differently abled and invalid persons.

1.2.1.3 Window whose minimum surface dimensions measured through the center of its area are less than 200 mm.

2 TERMINOLOGY

2.1 Seat — A structure complete with trim, capable of accommodating one or more adult person.

2.2 Window — An aperture in the sides of the bus to let in light and air. The window need not necessarily be glazed.

2.3 Emergency Exit — An emergency door, emergency window or escape hatch.

3 GENERAL REQUIREMENTS

3.1 The manufacturer/body builder has to specify the type of windows used in the bus.

3.2 Tests

3.2.1 *Test Conditions*

a) The vehicle is on a flat, horizontal surface. Alternatively, at the request of the manufacturer, the test can either be conducted on a prototype window (mock-up) which resembles the actual fitment on the vehicle or by using suitable simulation methods in agreement with the test agency.

b) The inside of the vehicle and the outside environment are kept at any temperature from 21 °C to 40 °C for 4 h immediately persuading the tests, and during the tests.

c) For the window retention test, windows are installed, closed, and latched (where latches are provided) in the condition intended for normal bus operation.

d) For the emergency exit release and extension tests, windows are installed as in (c) above. Seats, armrests, and interior objects near the windows are installed as for normal use, and seats are in the upright position.

3.2.2 *Window Retention Tests*

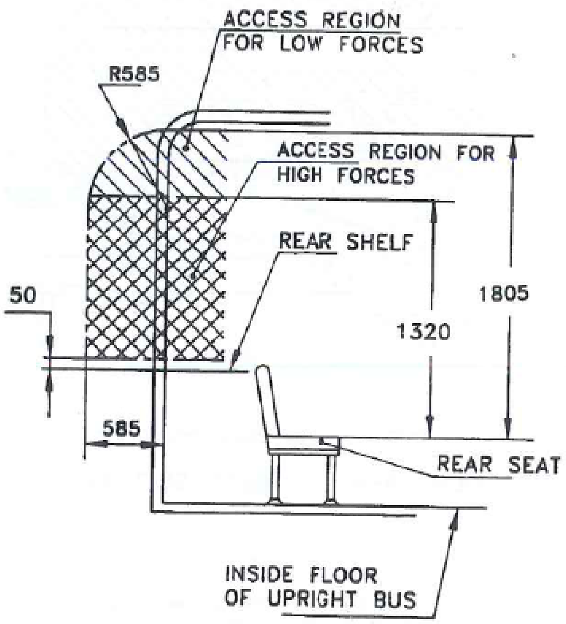
3.2.2.1 Window with largest surface dimensions and its each surrounding window frame, when tested in accordance with the procedure in **3.2.2.2** under the conditions of **3.2.1** (a) to (c) above, shall be retained by its surrounding structure in a manner that prevents the formation of any opening large enough to admit the passage of a 100 mm diameter sphere under a force, including the weight of the sphere, of 2 kg until any one of the following events occurred:

a) A force of 550 kg is reached;

b) At least 80 percent of the glazing thickness has developed cracks running from the load contact region to the periphery at two or more points, or shattering of the glazing occurs; and

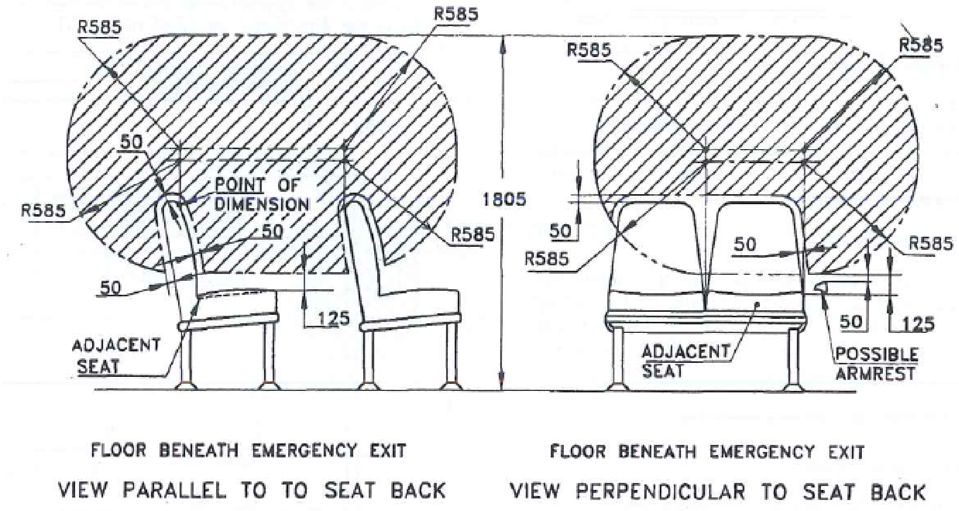
c) The inner surface of the glazing at the center of force application has moved relative to the window frame, along a line perpendicular to the undisturbed inner surface, a distance equal to 0.5 times the square root of the minimum surface dimension (in millimeters) measured through the center of the area of the entire sheet of window glazing.

3.2.2.2 An increasing force shall be applied to the window glazing through the head form specified in Fig. 7 outward and perpendicular to the undisturbed inside surface at the centre of the area of each sheet of window glazing with a head form travel of 50 mm per minute.



All dimensions in millimetres

FIG. 1 REAR EMERGENCY EXIT WITH REAR OBSTRUCTION


R585
R585
50
POINT OF
DIMENSION
50
R585
R585
50
125
1805
ADJACENT
SEAT
R585
R585
50
R585
50
R585
50
125
ADJACENT
SEAT
POSSIBLE
ARMREST
FLOOR BENEATH EMERGENCY EXIT
VIEW PARALLEL TO TO SEAT BACK
FLOOR BENEATH EMERGENCY EXIT
VIEW PERPENDICULAR TO SEAT BACK

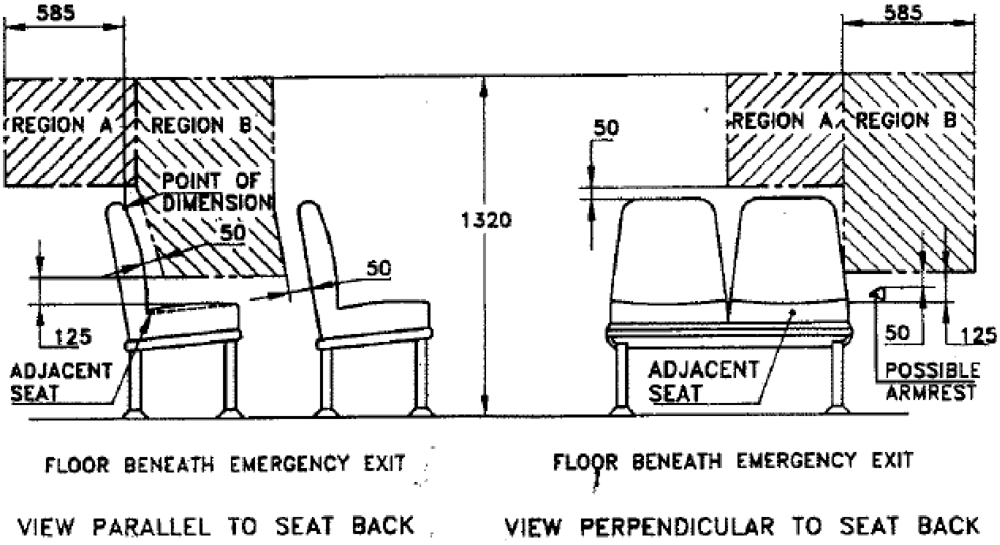
All dimensions in millimetres

NOTES

1 Clearance area around seat back, arm rests and other obstructions = 50 mm.

2 Access region is the spatial volume created by the Intersection or the Projections of the areas shown in the two views.

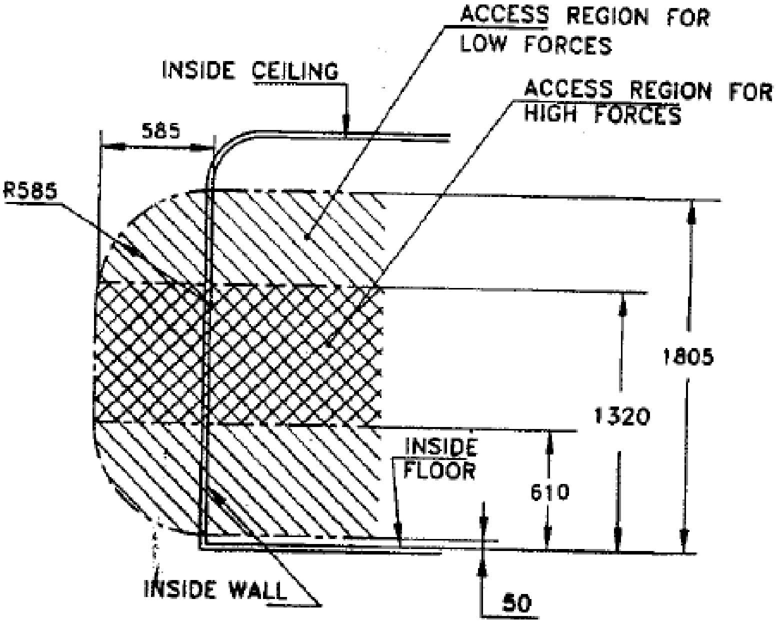
FIG. 2 ACCESS REGION FOR LOW FORCES FOR EMERGENCY EXITS HAVING ADJACENT SEATS



All dimensions in millimetres

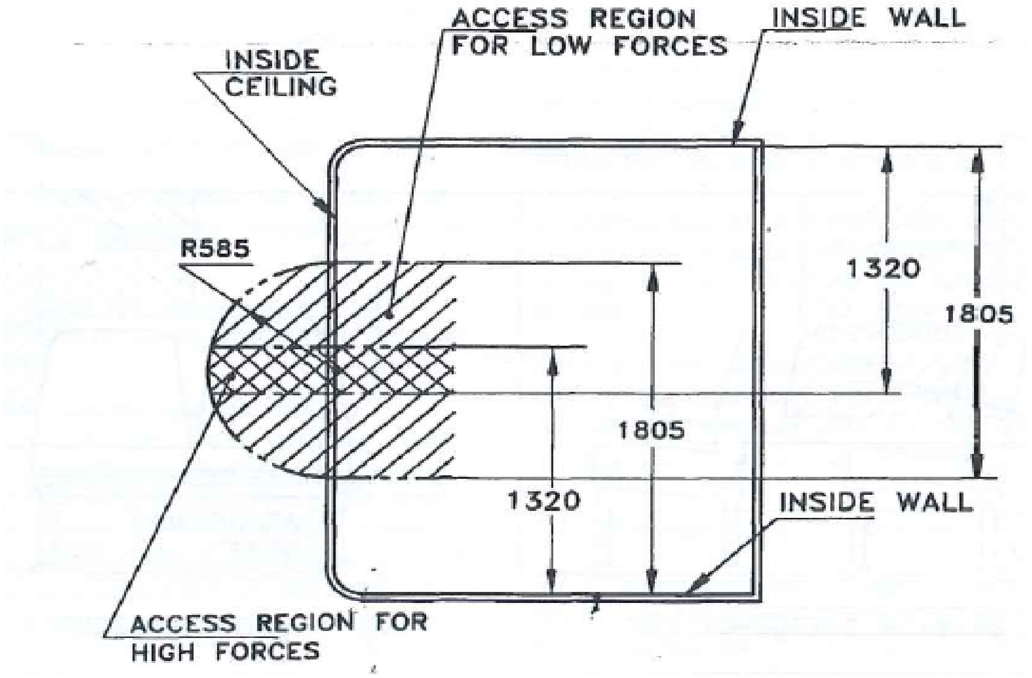
NOTE — Clearance area around seat back arm rests, and other obstructions ≈ 50 mm

FIG. 3 ACCESS REGION FOR HIGH FORCES FOR EMERGENCY EXITS HAVING ADJACENT SEAT



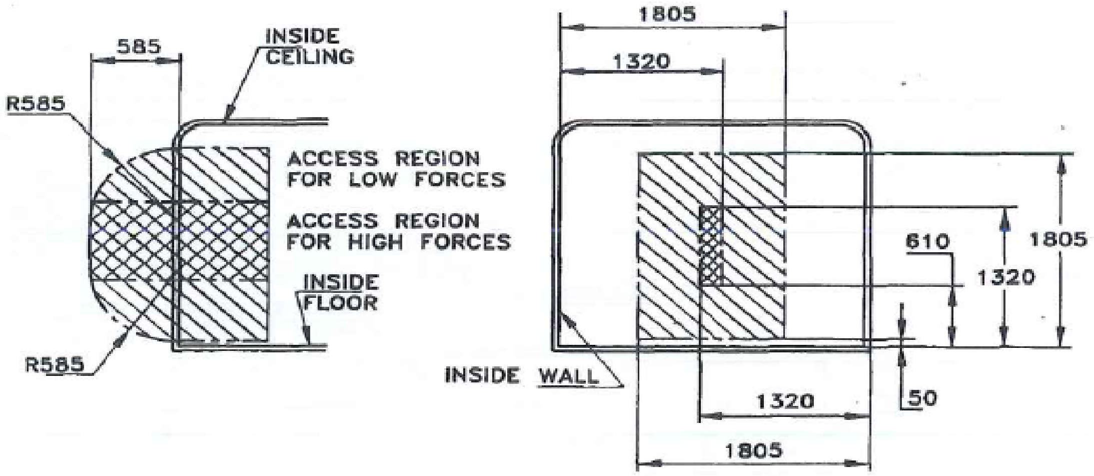
All dimensions in millimetres

FIG. 4 SIDE EMERGENCY EXIT



All dimensions in millimetres

FIG. 5 ROOF EMERGENCY EXIT



All dimensions in millimetres

FIG. 6 REAR EMERGENCY EXIT WITHOUT REAR OBSTRUCTION

3.2.3 *Release Mechanism Tests*

3.2.3.1 Each emergency exit not required for school buses shall allow manual release of the exit by a single occupant using force applications each of which conforms, at the option of the manufacturer, either to (a) or (b). The release mechanism or mechanisms shall require for release one or two force applications, at least one of which differs by 90° to 180° from the direction of the initial push-out motion of the emergency exit (outward and perpendicular to the exit surface).

a) *Low-force application*
   1) *Location:* As shown in Fig. 1, 2, 4 to 6.
   2) *Type of motion*: Rotary or straight.
   3) *Magnitude of force*: Not more than 9 kg.

b) *High force application*
   1) *Location*: As shown in Fig. 1, 3 to 6.
   2) *Type of motion*: Straight, perpendicular to the undisturbed exit surface.
   3) *Magnitude*: Not more than 27 kg.

3.2.3.2 When tested both before and after the window retention test, each school bus emergency door shall allow manual release of the door by a single person, from both inside and outside the bus passenger compartment, using a force application that conforms to (a) to (c) given below. Each release mechanism shall operate without the use of remote controls or tools and notwithstanding any failure of the vehicle's power system.

a) *Location* — Within the high force access region shown in Fig. 4 for a side emergency door and in Fig. 6 for a rear emergency door.
b) *Type of motion* — Upward from inside the bus; at the discretion of the manufacturer from outside the bus.
c) *Magnitude of force* — Not more than 18 kg.

3.3 Technical Specifications to be Submitted by the Vehicle Manufacturer/Body Builder/Window Manufacturer

3.3.1 *Name of the Vehicle Manufacturer/Bus Body Builder*

3.3.2 *Category of Vehicle*

3.3.3 *Seating Capacity*

3.3.4 *GVW, in kg*

3.3.5 *Type of Bus*

3.3.6 *Details of Safety Glass Fitted on Vehicle*

3.3.6.1 *Make of the side glass*

3.3.6.2 *Thickness*

3.3.6.3 *BIS/License No.*

3.3.6.4 *Make of rear wind shield glass*

3.3.6.5 *Thickness*

3.3.6.6 *BIS/License No*

3.3.7 *Information Regarding Emergency Exit*

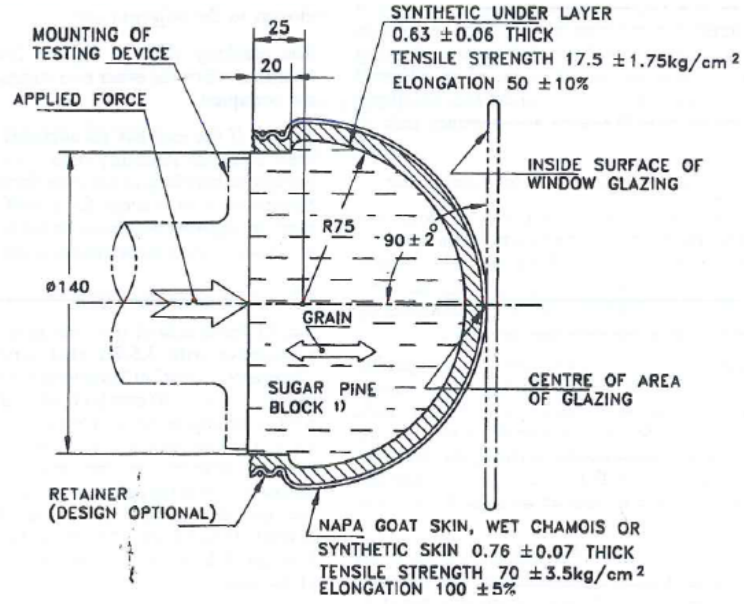
No. of Emergency Exit	**Side Windows**	**Doors**	**Rear Wind Shield**	**Roof Exit**
Right Side				
Left Side				

3.3.8 *Information Required in the Installation Drawings*

3.3.9 *Seating Layout of the Vehicle*

3.3.10 *Sizes of the Windows Fitted on Each Side of the Bus*

3.3.11 *In Case of Sliding Windows, Mounting Details* (*For Example, Size of the Channel Used for Fitment of the Frame*)



NOTE — Sugar pine with grain direction perpendicular to base and parallel to grain to withstand appreciable crush (280 kg/cm² to 350 kg cm²) or equivalent wooden from capable of meeting the specified values.

All dimensions in millimetres

FIG. 7 HEADFORM

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Automotive Body, Chassis, Accessories, Springs and Suspension Systems Sectional Committee, TED 06

Organization	*Representative(s)*
Automotive Research Association of India, Pune	Shri M. Sreenivasulu (***Chairman***) Shri A. Akbar Badusha (*Alternate* I) Shri B. S. Yamgar (*Alternate* II)
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Hero Motocorp	Nomination Awaited
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Honda Motorcycle & Scooter India Pvt Ltd	Nomination Awaited
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Scientist 'E' (TED), BIS

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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